A COMPARISON OF THE EFFECTS OF DDT AND SEVIN ON LITTER DECOMPOSITION AND LITTER FAUNA IN A CULTIVATED FIELD

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INTRODUCTION

Insecticides are applied to agricultural crops for the reduction of certain "target" organisms. However, insecticides are not specific poisons. In treated areas they are toxic to many "non-target" organisms. These unintended side effects can result in the upset of the delicate balance within the crop ecosystem. The purpose of this study was to look at two potential "non-target" side effects resulting from insecticide stress: 1) changes in the decomposition rate of litter and 2) changes in litter fauna instrumental in litter decomposition and subsequent recycling of nutrients (Crossley and Hoglund, 1962; Crossley and Witkamp, 1964; Edwards, 1969).

Synthetic organic insecticides were used in this study because of their predominant use in agriculture in the United States. Synthetic organic insecticides are of three basic types: 1) organochlorine insecticides, 2) the organophosphorus insecticides and 3) the recently developed carbamate insecticides (Moriarty, 1969).

The organochlorine insecticides have been in use the longest. Due to their high stability in nature, agricultural use of organochlorine insecticides has become highly controversial in recent years. This high stability can be an undesirable characteristic in crop protection since persistent compounds will leave residues on food. Also, repeated applications can result in high accumulations of these compounds in the soil. DDT, BHC, chlorodane, and aldrin are examples of organochloride insecticides (Moore, 1967).

Lichtenstein (1966) reported that, in a comparison of various insecticides under field conditions, organophosphorus and carbamate insecticides were far less persistent than the organochlorines. As the drawbacks of organochlorines, especially DDT, have become known, use of the more rapidly detoxifying types has been increasing (Mitchell, 1966). Diazinon and parathion are examples of the organophosphorus type. Sevin is the best known of the carbamate type.

DDT, dichloro-diphenyl-trichloroethane, and Sevin, 1-napthyl methylcarbamate, were chosen for comparison in this study of "non-target" side effects of insecticides because of the great difference between their stabilities under field conditions. Edwards (1966) has reported that the half life of DDT in the soil is three years. Mitchell (1966) reported that the half life of Sevin in the soil is eight days.

The research of Menhinick (1962) on the combined effects of residual and non-residual orchard pesticides and Malone (1969) with diazinon indicated that the decomposition rate of litter can be increased by pesticide use. This was contrary to the decreased decomposition rate found by Crossley and Witkamp (1964) with napthalene, a coal tar distillate, and Barrett (1968) with Sevin. Edwards (1969) reported increased decomposition rates with DDT but decreased rates with aldrin.

Insecticide stress has been reported to cause increased populations of some taxa within litter and soil fauna. Klostermeyer and Rasmussen (1953) found increased populations of mites were associated with increased applications of DDT to the soil. Edwards and Dennis (1960) and Edwards, et al. (1967) found DDT increased the number of Collembola in litter while aldrin significantly decreased the numbers of these organisms. Menhinick (1962) found general orchard pesticides significantly increased the number of Acarina and Collembola in both litter and soil.

In this study a litter bag method was used to determine the rate of weight loss by litter, and thus decomposition, as it might be affected by DDT or Sevin under standardized conditions. The fauna within the litter bags was counted and identified to order to determine the numbers and composition of litter fauna and how it was affected by each insecticide.

METHODS AND MATERIALS

A litter bag method which encloses dried plant material in nylon net bags was used in this study. It made possible a more accurate determination of litter decomposition in the field than the sampling of uncontained litter. Also, unlike the sampling of loose litter, the litter samples could be collected quickly without the loss of the fauna inhabiting the litter. Many members of this fauna aid in litter decomposition by disintegrating and digesting the plant detritus, breaking it down into its simpler organic and inorganic constituents. A disadvantage of this method was the exclusion from the bags of most earthworms which are important in the formation of humus (Edwards, 1969).

The litter bag method used was most similar to that of Shanks and Olson (1961) except in the present study smaller litter samples were placed in bags of smaller size.

The study area was an abandoned pasture of one-half acre located at 1561 Hull Avenue in a suburban section of Des Moines, Polk County, Iowa. It was surrounded by a fallow field on the south side, homes on the east and north sides and a stand of boxelders (*Acer negundo* L.) on the west side.

The actual experimental area was 80 m long running north and south and 24 m wide running east and west. On April 12, 1968 the plot was seeded to oats (*Avena sativa* L.)

at a rate of 64 lb/acre. The experimental area was then marked out into 30 plots, each 8 m by 8 m, by placing stakes at the corners of each plot.

On June 28, 1968 a portion of the green vegetation outside the actual experimental area was clipped to ground level. It was then sorted so only the oats remained. The oats were then cut into 13 cm lengths and dried at 100°C. for 24 hours. Tem gram samples of mixed plant parts were placed in nylon net bags 25 cm by 25 cm. The tops of the bags were folded over and closed with two safety pins. The nylon net mesh size of 2.3 mm was fine enough to restrict loss of litter fragments but large enough for passage of microarthropods (Shanks and Olson, 1961).

A one m^2 area was clipped to ground level in the center of each of the 30 plots, taking care not to disturb the rest of the plot. On July 6, 1968 seven litter bags containing the dried plant material were placed in the clipped area in each experimental plot. The bags were positioned in the same regular pattern in all plots. A 3 inch nail was placed through one of the safety pins at the top of each bag and anchored securely in the ground.

After the bags had been in the field for one week, one bag was removed from each plot. These were used to check the uniformity of conditions in the plots before treatment with insecticides. The litter bags were placed in labeled plastic bags for transportation to the laboratory. The plastic bags helped to avoid any loss of detritus or organisms.

On July 19, 1968 insecticides were applied to the plots with a backpack sprayer in a grid pattern (Fig. 1). This pattern was chosen so a similar number of plots receiving each type of treatment would be in the tree shaded areas on the east and west sides of the field. Ten plots were each treated with 12 liters of waters of water containing 14 grams of Sevin (Sevin 50-WP). Ten plots were each treated with 12 liters of water containing 14 grams of DDT (DDT 50-WP). These quantities were equivalent to the one pound of active insecticide per acre recommended by the manufacturers for small grains. The ten control plots were each treated with 12 liters of water.

Twenty-four hours after the insecticide application the second set of 30 litter bags were removed from the field. The remaining bags were removed 30 at a time, one from each plot, on July 27, August 3, August 10, September 7 and October 5, 1968. Thirteen weeks after their placement in the experimental plots all 210 litter bags had been removed.

The litter samples were transported to the laboratory in plastic bags where they were placed in Tullgren funnels to extract the microarthropods. Three racks were constructed similarly to a description given by Cox (1967). Each rack held 10 funnels. The funnels were 17 cm across the top. Forty-watt bulbs were placed 9 cm above the top of the funnels. Reflectors made of #10 size cans fitted snugly inside the rim of the funnels and around the neck of the

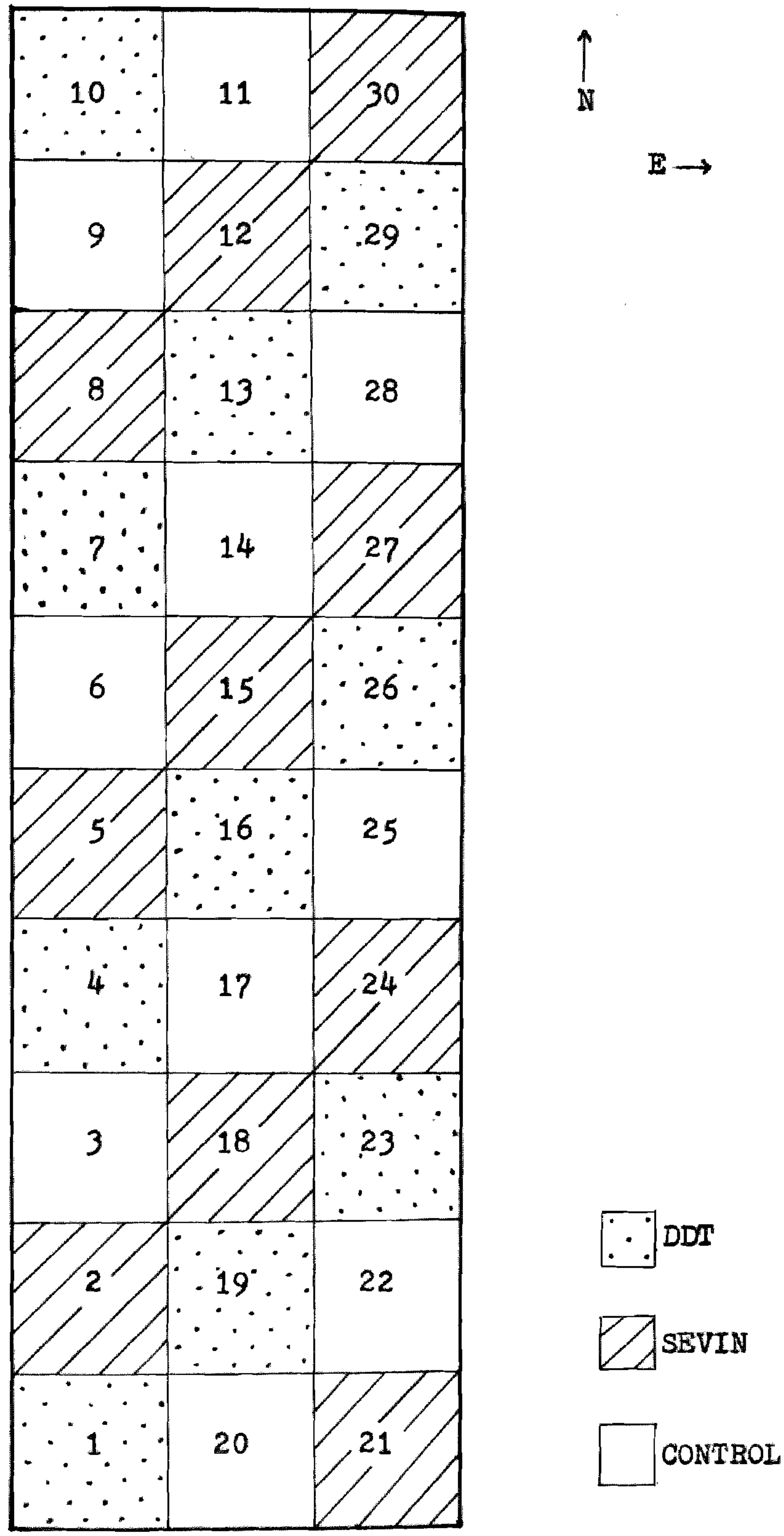

Fig. 1. Grid pattern used for application of insecticides to experimental area.

light bulbs. The litter fauna was collected in small bottles containing 70% ethyl alcohol that were placed under the funnels. This extraction procedure was used on each sample for 24 hours.

After the extraction procedure was completed, the bags containing the litter samples were floated on water for one minute to remove soil splashed into the bags by heavy rains. The samples were again dried at 100°C. for 24 hours, allowed to cool in the oven and weighed to the nearest .01 gram. A form of Student's t-test was used to determine the statistical significance of differences in the mean weights of the litter samples from the plots receiving the three different treatments. The form of the Student's t-test used was specifically for comparing the means of two small samples from normal populations, variances assumed to be equal (Bailey, 1959). The data was compared for each sampling date.

The fauna collected from the litter samples was classified and counted using a dissecting scope. The organisms were classified to order according to Metcalf and Metcalf (1928), Jacques (1947), Chu (1949), Essig (1958), and Borror and DeLong (1964). The Student's t-test was used to determine the significance of differences in the mean numbers of total fauna, mites, Collembola and fauna other than mites and Collembola collected from the plots receiving the three different treatments. The form of the

Student's t-test used for this portion of the data was specifically for comparing two small samples from normal populations, variances not assumed to be equal (Bailey, 1959).

RESULTS

Litter weights. The changes in litter weights during the 13 week study are shown in Tables 1, 2 and 3.

After the litter bags had been in the field one week the mean dry weight of the litter bag material was 9.15 g in the control plots, 8.92 g in the Sevin treated plots and 9.13 g in the DDT treated plots. There was no significant difference in mean weight using the Student's t-test which would indicate that decomposition was taking place at a similar rate in the three groups of plots prior to insecticide application.

The insecticides were applied 24 hours before collection of the second group of litter bags. At the time of collection these litter samples had been in the field two weeks. The mean dry weight of the litter samples was 8.71 g in the control plots, 8.58 g in the Sevin treated plots and 8.56 in the DDT treated plots. There was no significant difference between groups.

In the third group of samples the mean dry weight of the litter was 8.06 g in the control plots, 7.56 g in the Sevin treated plots and 7.76 g in the DDT treated plots. There was no significant difference between the mean weight

Table 1. Weight (g) of litter bag contents in control plots. Initial weights on July 6 were 10 g. (---- indicates vandalized samples.)

PLOT NUMBERS	COLLECTION DATES 7/13	7/20	7/27	8/3	8/10	9/7	10/5
3	8.40	----	----	----	----	----	----
6	9.25	9.63	8.57	8.53	7.48	3.35	3.00
9	8.86	8.68	8.59	9.43	6.14	4.11	3.43
11	8.93	7.67	8.33	6.93	6.21	6.19	4.00
14	9.51	7.82	8.03	7.54	7.21	5.68	4.47
17	8.96	8.56	7.36	8.23	7.76	5.28	2.62
20	9.76	----	----	----	----	----	----
22	9.53	8.86	8.66	7.86	7.50	5.18	3.69
25	9.23	9.48	7.65	7.42	6.01	4.43	3.21
28	9.10	8.97	7.31	7.82	5.19	5.09	5.84
$\bar{X}$	9.15	8.71	8.06	7.98	6.56	4.91	3.78

Table 2. Weight (g) of litter bag contents in Sevin treated plots. Initial weights on July 6 were 10 g. (----indicates vandalized samples.)

	COLLECTION DATES						
PLOT NUMBERS	7/13	7/20	7/27	8/3	8/10	9/7	10/5
1	8.53	8.50	7.31	8.41	6.63	3.58	2.62
4	8.21	7.11	7.11	6.02	6.44	3.78	3.40
7	8.84	9.19	8.84	8.40	6.41	3.95	4.84
10	8.46	9.23	8.17	8.81	6.66	3.51	4.25
13	8.78	9.17	8.32	8.05	7.45	5.33	3.49
16	9.67	8.19	7.01	7.06	6.69	4.96	5.33
19	9.21	7.59	7.01	----	----	----	----
23	9.47	8.39	7.68	8.24	6.40	3.48	2.73
26	8.57	8.22	6.81	8.09	7.19	5.41	3.44
29	9.50	10.16	7.30	8.13	6.50	4.81	2.68
$\bar{X}$	8.92	8.58	7.56	7.91	6.70	3.64	3.64

Table 3. Weight (g) of litter bag contents in DDT treated plots. Initial weights on July 6 were 10 g.

	COLLECTION DATES						
PLOT NUMBERS	7/13	7/20	7/27	8/3	8/10	9/7	10/5
2	8.48	8.58	7.26	7.54	7.36	4.35	3.41
5	8.35	8.68	7.11	7.93	5.19	2.73	1.63
8	9.43	8.20	8.98	7.88	7.50	3.90	3.43
12	9.00	7.98	7.75	8.12	7.63	4.31	4.42
15	8.87	8.57	8.18	6.94	7.66	5.18	4.54
18	9.42	8.62	8.72	7.90	6.85	4.06	2.54
21	9.91	8.94	8.12	8.47	7.01	2.42	2.86
24	9.00	7.99	7.05	6.99	6.09	4.98	2.98
27	9.24	8.56	6.16	7.45	6.15	5.42	3.17
30	9.57	9.49	8.24	8.51	8.34	5.61	2.99
$\bar{X}$	9.13	8.56	7.76	7.77	6.98	4.30	3.20

of the control and DDT treated samples. There was a significant difference at the .01 level between the mean weight of the control and Sevin treated samples.

In the fourth group of samples the mean dry weight of the litter samples was 7.98 g in the control plots, 7.91 g in the Sevin treated plots and 7.77 g in the DDT treated plots. There was no significant difference between these mean weights. (The mean weight of the Sevin treated samples from the fourth week was higher than that of the third week suggesting that the third week mean was not reliable.)

The fifth group of samples was collected after they had been in the field five weeks. The mean dry weight of the litter samples was 6.56 g in the control plots, 6.71 g in the Sevin treated plots and 6.98 g in the DDT treated plots. There was no significant difference between these mean weights.

The sixth group of samples was collected at the end of nine weeks. The mean dry weight of the litter samples was 4.91 g in the control plots, 3.64 g in the Sevin treated plots and 4.30 g in the DDT treated plots. There was no significant difference between these mean weights.

A comparison of the mean weight in grams of litter samples in control and insecticide treated plots for the seven collection dates is presented in Table 4. Weight loss of litter samples indicated that after 13 weeks in the field oat hay was 62.2 per cent decomposed in control plots,

Table 4. The mean weight (g) of litter samples ± standard error from control and insecticide treated plots. Litter bags were placed on July 6 and each initially contained 10 g of oat hay.

COLLECTION DATE		TREATMENT		
		CONTROL	SEVIN	DDT
7/13	(N)	10	10	10
	$\bar{X} \pm s_{\bar{X}}$	9.15±0.12	8.29±0.15	9.13±0.15
7/20	(N)	8	10	10
	$\bar{X} \pm s_{\bar{X}}$	8.17±0.26	8.58±0.28	8.56±0.14
7/27	(N)	8	10	10
	$\bar{X} \pm s_{\bar{X}}$	8.06±0.20	7.56±0.21	7.76±0.27
8/3	(N)	8	9	10
	$\bar{X} \pm s_{\bar{X}}$	7.98±0.27	7.91±0.28	7.77±0.17
8/10	(N)	8	9	10
	$\bar{X} \pm s_{\bar{X}}$	6.56±0.29	6.71±0.12	6.98±0.30
9/7	(N)	8	9	10
	$\bar{X} \pm s_{\bar{X}}$	4.91±0.32	3.64±0.36	4.30±0.34
10/5	(N)	8	9	10
	$\bar{X} \pm s_{\bar{X}}$	3.78±0.36	3.64±0.32	3.20±0.27

63.3 per cent decomposed in Sevin treated plots and 68.0 per cent decomposed in DDT treated plots.

On the night of July 12, 1968 the experimental area was vandalized. All litter bags remaining in control plots 3 and 20 and four of the bags remaining in Sevin treated plot 19 were so badly damaged they could not be salvaged. Other plots were not disturbed.

Fauna. The organisms from litter samples of three adjacent plots representing all three experimental treatments were classified and counted for the seven collection periods (Table 5). These three plots were chosen because the amount of shade received and the appearance of the vegetation and soil was most similar of any of the adjacent plots.

An apparent correlation was found between the total number of organisms collected from these plots (Fig. 2) and the total rainfall for the week preceeding the collection date (Fig. 3). For example, the total rainfall was lower for the week of August 3 than for either the week of July 27 or August 10. The total fauna collected on August 3 was also correspondingly lower than the number collected from either the preceding or following sampling date. On the last collection date, October 5, the total rainfall was not high but the average daily temperatures were at the lowest point of the entire experimental period and the litter remained

Table 5. Fauna collected from three adjacent experimental plots representing the three experimental treatments.

	COLLECTION DATES						
FAUNA	7/13	7/20	7/27	8/3	8/10	9/7	10/5
CONTROL							
COLLEMBOLA	0	5	6	4	34	27	35
MITES	0	17	35	14	195	96	436
OTHERS	0	4	4	8	4	13	32
TOTAL	0	26	45	26	233	136	503
SEVIN							
COLLEMBOLA	0	6	2	5	17	11	36
MITES	0	41	113	77	201	76	137
OTHERS	0	1	10	2	8	7	11
TOTAL	0	48	125	84	226	94	184
DDT							
COLLEMBOLA	0	4	35	0	89	63	171
MITES	0	63	73	2	115	141	168
OTHERS	0	1	17	0	1	15	2
TOTAL	0	68	125	2	205	219	341

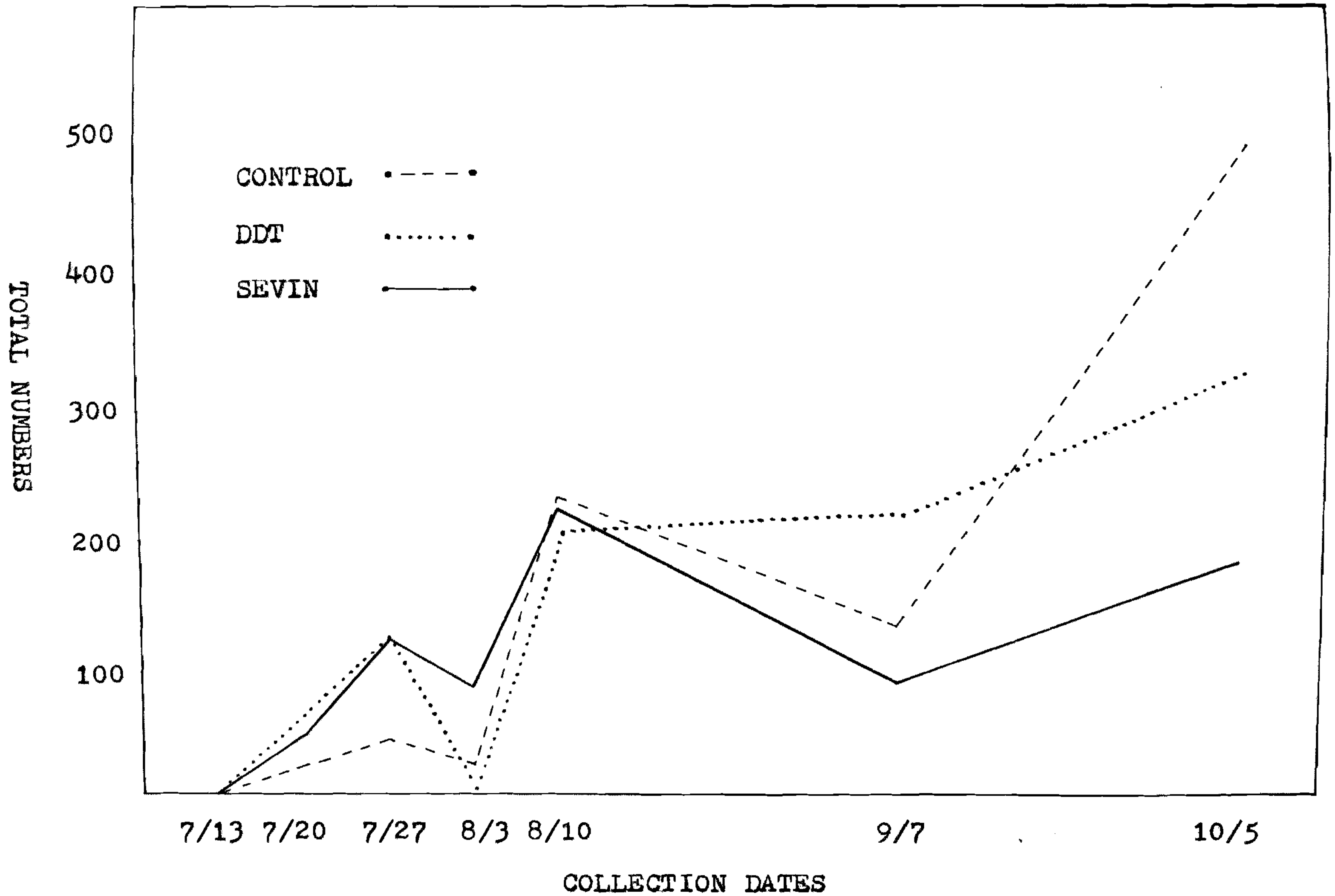

Fig. 2. Total numbers of litter fauna collected from three adjacent experimental plots.

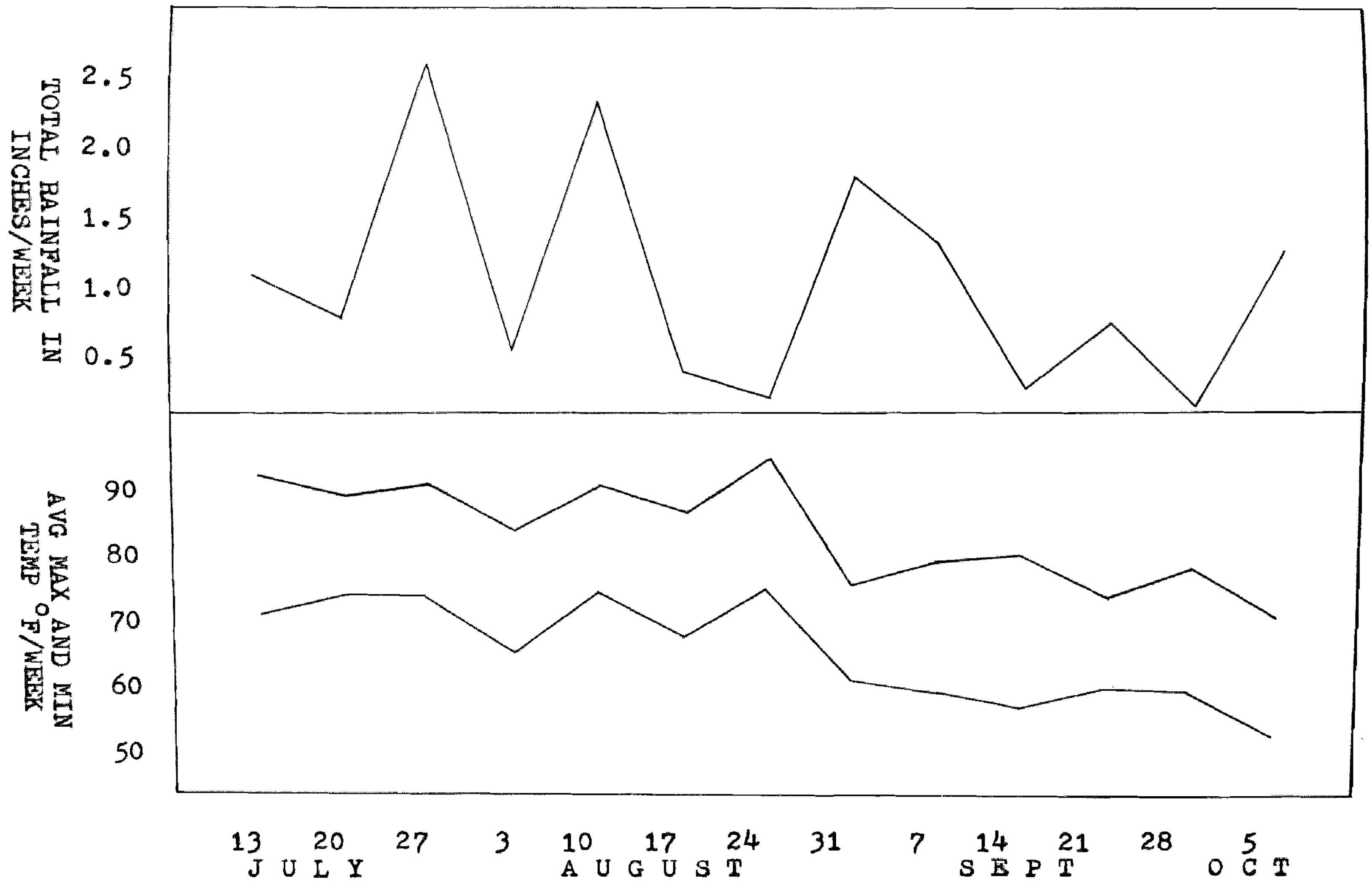

Fig. 3. Total rainfall and average maximum and minimum temperatures for the week preceding date. (Environmental Science Services Administration)

moist. Crossley and Hoglund (1962) reported a similar influence of moisture on the number of fauna collected from litter bag samples. Their suggestion that such fluctuations were caused by migrations in and out of the litter bags in response to moisture conditions could also be applied to the observations in this study.

Since there were similar fluctuations in response to moisture in the plots receiving the different experimental treatments, it was decided that an examination of the organisms collected from all plots 24 hours after spraying and those collected from all plots after 13 weeks in the field would be sufficient to show any cumulative effects and would eliminate the environmental response. The mean number of all organisms collected from the litter samples 24 hours after spraying was 38.1 in the control plots, 22.4 in the Sevin treated plots and 45.8 in the DDT treated plots (Table 6). There was no significant difference in these mean values as tested by a Student's t-test. (Table 7.)

The mean number of all organisms collected from the litter samples on the last collection date was 163.1 in the control plots, 134.1 in the Sevin treated plots and 152.0 in the DDT treated plots. There was no significant difference between the means. (Table 8.)

The organisms collected from the litter samples at the times mentioned were divided into several taxons to determine other possible relationships. First, the mean

Table 6. Mean number and standard error of fauna from litter bag samples in control and insecticide treated plots 24 hours and 11 weeks after spraying.

FAUNA	CONTROL	TREATMENT SEVIN	DDT
JULY 20			
TOTAL FAUNA	38.1±16.7	22.4±13.0	45.8± 6.2
COLLEMBOLA	19.4±11.5	2.9± 1.9	12.6±12.8
MITES	10.1± 2.9	12.6± 4.6	27.6±12.8
OTHER FAUNA	9.8± 2.3	6.9± 2.1	5.7± 1.7
OCTOBER 5			
TOTAL FAUNA	163.1±56.7	134.1±23.7	152.0±40.5
COLLEMBOLA	45.4±42.6	36.7±12.8	60.2±18.7
MITES	108.3±49.8	91.0±16.1	89.4±28.1
OTHER FAUNA	11.3± 3.1	6.4± 0.9	2.4± 0.7

Table 7. T values as determined by comparison of mean number of fauna on July 20.

	CONTROL				DDT			
	TOTAL FAUNA	COLLEMBOLA	MITES	OTHER FAUNA	TOTAL FAUNA	COLLEMBOLA	MITES	OTHER FAUNA
SEVIN								
TOTAL FAUNA	1.09				1.33			
COLLEMBOLA		1.48				1.86		
MITES			0.45				1.11	
OTHER FAUNA				0.92				0.44
DDT								
TOTAL FAUNA	0.37							
COLLEMBOLA		0.55						
MITES			1.34					
OTHER FAUNA				1.44				

Table 8. T values as determined by comparison of mean number of fauna on October 5 using Student's t-test. Double asterisks indicate significant differences in numbers at the .01 level.

	CONTROL				DDT			
	TOTAL FAUNA	COLLEMBOLA	MITES	OTHER FAUNA	TOTAL FAUNA	COLLEMBOLA	MITES	OTHER FAUNA
SEVIN								
TOTAL FAUNA	0.47				0.38			
COLLEMBOLA		0.49				1.04		
MITES			0.33				0.05	
OTHER FAUNA				1.50				3.57**
DDT								
TOTAL FAUNA	0.16							
COLLEMBOLA		0.64						
MITES			0.34					
OTHER FAUNA				2.81**				

number of Collembola from the three groups of plots were compared. The mean number of Collembola 24 hours after spraying was 19.4 in the control plots, 2.9 in the Sevin treated plots and 12.6 in the DDT treated plots. Although Sevin appeared to have a more immediate effect on the Collembola population than the DDT or water, with a considerable reduction in numbers, there was no significant statistical difference.

The mean number of Collembola on the last collection date was 45.4 in the control plots, 36.7 in the Sevin treated plots and 60.2 in the DDT treated plots. There was no significant difference between these mean numbers.

The second taxon to be compared was the mites, consisting almost entirely of the group Oribatei. The mean number of mites 24 hours after spraying was 10.1 in the control plots, 12.6 in the Sevin treated plots and 27.6 in the DDT treated plots. There was no significant difference between these mean numbers.

The mean number of mites on the last collection date was 108.3 in the control plots, 91.0 in the Sevin treated plots and 89.4 in the DDT treated plots. There was no significant difference between these mean numbers.

All fauna other than mites and Collembola were considered as a taxon referred to as "other fauna". This group consisted of small numbers of Hemiptera, Hymenoptera, Isopoda, Thysanoptera, Isoptera, Chilopoda, Araneida, Thysanura, Diptera, Coleoptera, Annelida and various immature forms. The immature forms were largely Coleoptera and Diptera larvae.

The mean number of other fauna 24 hours after spraying was 9.8 in the control plots, 6.9 in the Sevin treated plots and 5.7 in the DDT treated plots. There was no significant difference between these mean numbers.

The mean number of other fauna from the last collection date was 11.3 in the control plots, 6.4 in the Sevin treated plots and 2.4 in the DDT treated plots. There was no significant difference between the mean number of other fauna in the Sevin treated and control plots. However, there was a significant difference at the .01 level between the number of other fauna in the DDT treated plots and the control plots. There was also a significant difference at the .01 level between the mean number of other fauna in the DDT treated plots and the Sevin treated plots.

The largest number of litter fauna were Collembola, or springtails, and Oribatid mites. Many other Arthropod orders and a few earthworms were represented in much smaller numbers (Table 6).

The surface application of insecticides in this study did not cause statistically significant changes in the composition of the litter fauna within 24 hours. However, after 13 weeks there were significantly less fauna other than mites and Collembola in the plots sprayed with DDT than those sprayed with Sevin or water.

DISCUSSION

Litter weights. The litter samples in this study were in the field from one to thirteen weeks before sampling so only the insecticide effects on the initial period of rapid decomposition reported by Crossley and Hoglund (1962) were observed. Barrett (1968) found the decomposition rate of dried millet significantly decreased three weeks after surface application of Sevin. Similar short term effects did not develop with the surface application of insecticides to oats and oat litter in this study. No significant differences developed between mean weight loss of the litter samples in the insecticide and control plots during the experimental period. If the experimental period had been extended, a possibility for further research, the increased decomposition rate of litter reported by Edwards (1969) nine months after application of DDT might have developed. Malone (1969) also found increased rates of decomposition of litter samples placed in a field one year after the field had been treated with diazinon.

Fauna. The total number of litter fauna in this study was not significantly changed by insecticides, either 24 hours or 11 weeks after insecticide treatment. The significant decrease in "other fauna" in the DDT plots after 13 weeks was compensated for by increased numbers of mites and Collembola (Table 6). Edwards (1969) reported similar results with single applications of DDT and aldrin.

The most obvious immediate insecticide effects on the litter fauna were those of Sevin on Collembola 24 hours after spraying. The mean number of Collembola in the control plots was more than six times that of the Sevin treated plots (Table 6). Recovery of the Collembola was nearly complete, however, 11 weeks later. These results are similar to those obtained by Malone (1969) with diazinon. He found the population of Collembola greatly reduced one week after treatment but nearly recovered five months later.

The DDT had little apparent effect on the Collembola population. Wallace (1954) and Edwards (1969) reported Collembola populations to be similarly unaffected by DDT.

Neither Sevin or DDT appeared to have had very large effects on the mite population of the litter either 24 hours or 11 weeks after the insecticides were applied. Similarly diazinon has been found to have less first year effects on the mites than the Collembola (Malone, 1969).

The number of mites and Collembola recovered from the litter samples was far greater than those of any other taxon. However, the small number of organisms other than these two groups are important because of their larger individual biomass and their role as predators on the smaller mites and Collembola. These larger organisms were grouped together for statistical analysis as "other fauna".

Significant immediate insecticide effects on the other fauna were not observed. However, after 11 weeks the reduction of other fauna by DDT was highly significant as compared to the effects of Sevin or water. Edwards and Dennis (1960) reported similar effects on the larger organisms with DDT.

The resurgence or "flare-up" of soil and litter microarthropod populations after insecticide treatment has been frequently observed (Wingo and Thomas, 1948; Klostermeyer and Rasmussen, 1953; Edwards and Dennis, 1960; Menhenick, 1962; Edwards, 1969). Although no resurgence occurred during the experimental period, the great reduction in larger biomass organisms suggests that such a situation could have occurred later, due to decreased predator pressure on the microarthropods or other changes in food web relationships. A study of one or two years would be needed to see if such a resurgence might occur.

The litter bag method as used in this study has several advantages over the sampling of loose litter. First, a known amount of litter can be sampled without the loss of any but the smallest fragments, making accurate quantitative measurements of weight loss possible. Second, having the litter confined makes rapid collection of samples possible so more active fauna do not escape.

One of the disadvantages encountered using this method was caused by the soil that splashed into the bags after heavy summer rains. The litter bags had to be floated on water to remove the soil. This extra handling of the samples may have increased the apparent weight loss. There is no mention of this problem in the literature although it must have been encountered by other workers.

Another disadvantage of this method was that by excluding the larger members of the fauna from the litter samples, their effects on other members of the fauna and rate of litter decomposition were also excluded.

SUMMARY

1. Nylon net litter bags containing dried oat plants were placed in a field of oats and sprayed with Sevin, DDT or water. Effects of the insecticides on litter decomposition rate and the litter fauna were observed.
2. There was no statistically significant difference in the rate of decomposition between the three treatments during the 13 week experimental period.
3. There was a greater reduction in the number of Collembola in the Sevin treated plots 24 hours after spraying than in the DDT or control plots.
4. At the end of the experimental period there was no statistically significant difference between the total number of fauna in the litter receiving the three treatments.
5. Litter fauna other than mites or Collembola were significantly decreased by DDT after 11 weeks.

6. These results indicate the need for a study of one or two years to compare the long range effects of DDT and Sevin on litter decomposition and fauna.

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